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Background

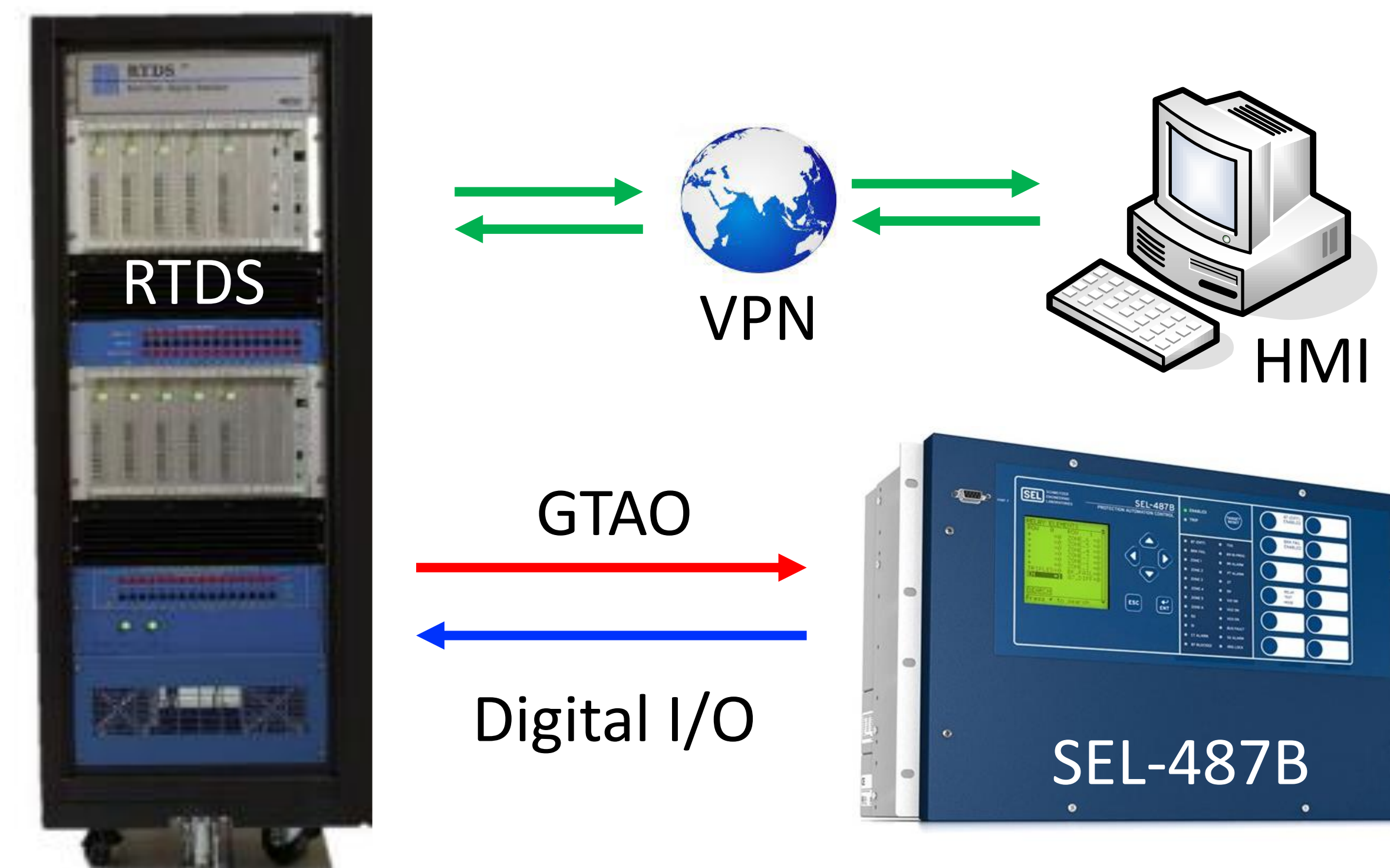
- Inverter based renewable energy sources are becoming more common.
- The introduction of these sources into the grid can cause instability in the power Grid.

Value Proposition

- Better understanding the effects of PV inverters on the power system can help us find innovative solutions to these issues.

Objectives

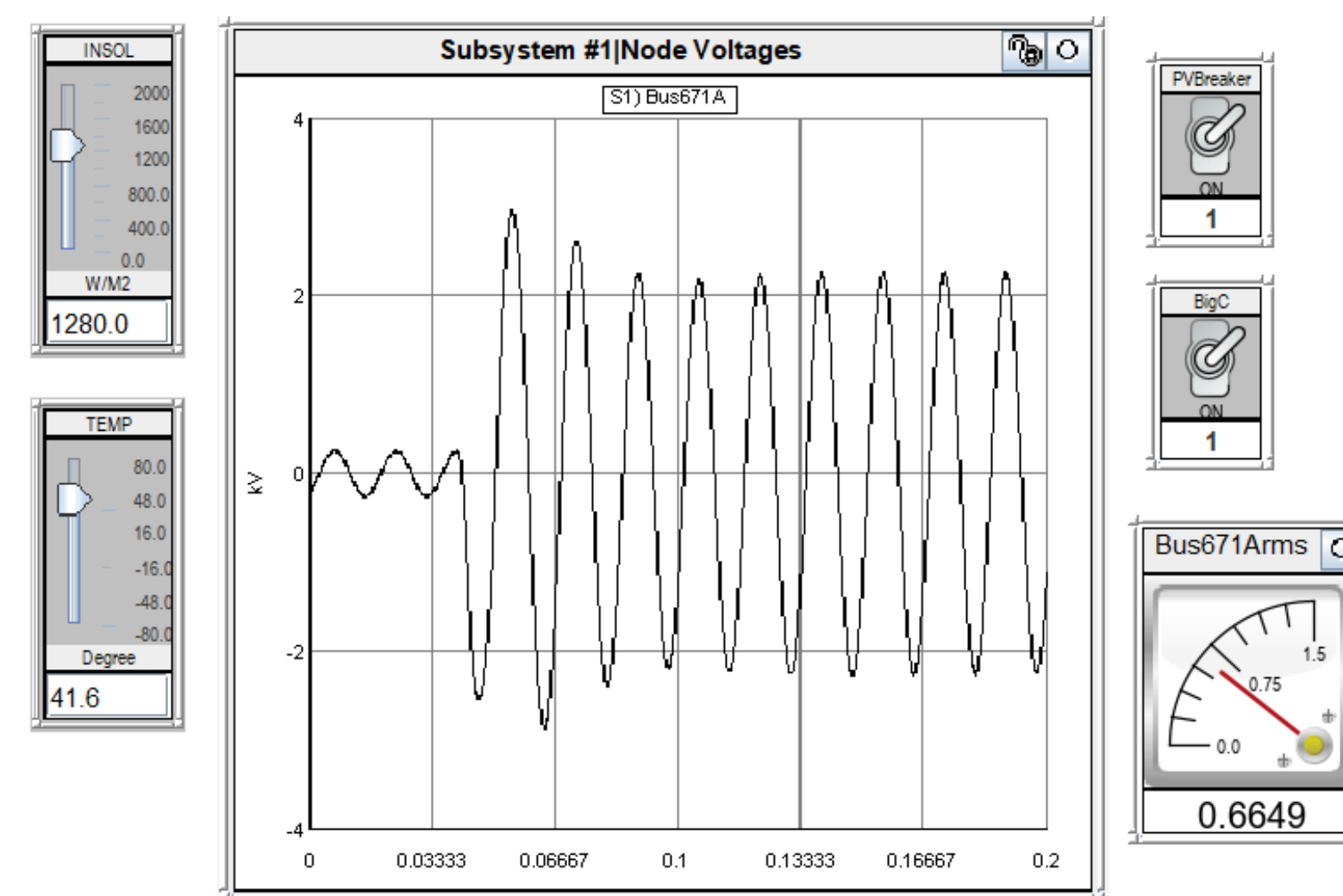
- Develop a Hardware-in-the-Loop (RTDS) model of a distribution system with multiple photovoltaic inverters.
- Implement external controls to coordinate power flow from the inverters.



Communications Diagram

Requirements and Design Validation

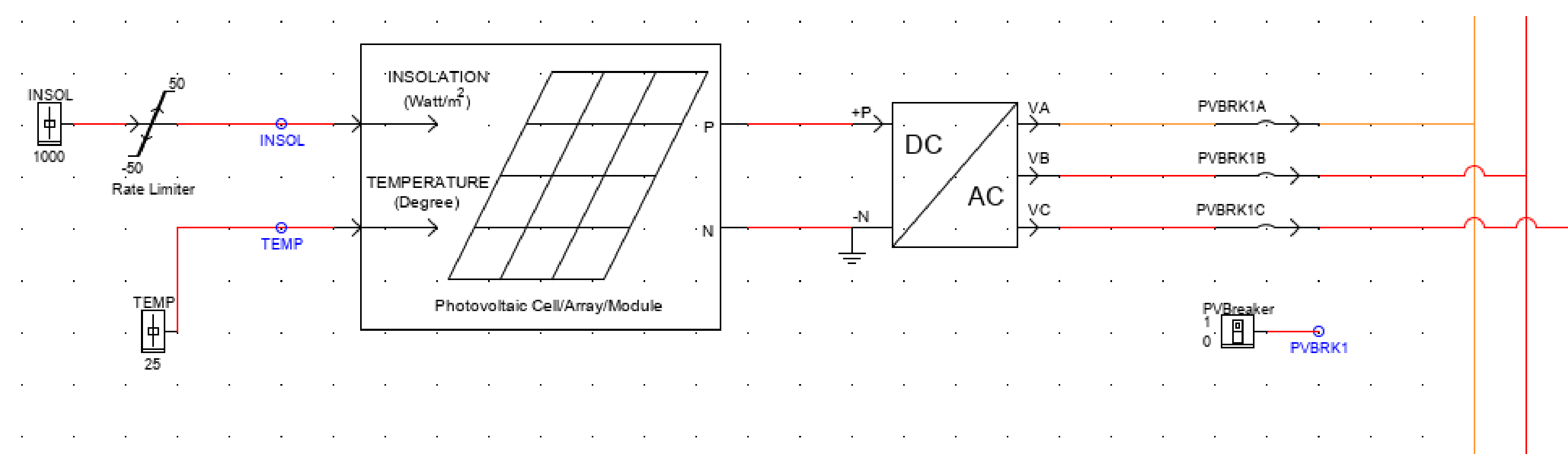
- Compiled RSCAD model of IEEE 13 bus system with 3 connected PV inverters.
 - Model compiles and runs on RTDS with expected bus voltage levels.
- Controlled Power output for each PV inverter.
 - Power flow adjusts as controls are manipulated in RSCAD.
- PV Inverter Breakers controlled through SEL-487B.
 - Manipulate PV controls through RTAC and observe changes in RTDS.



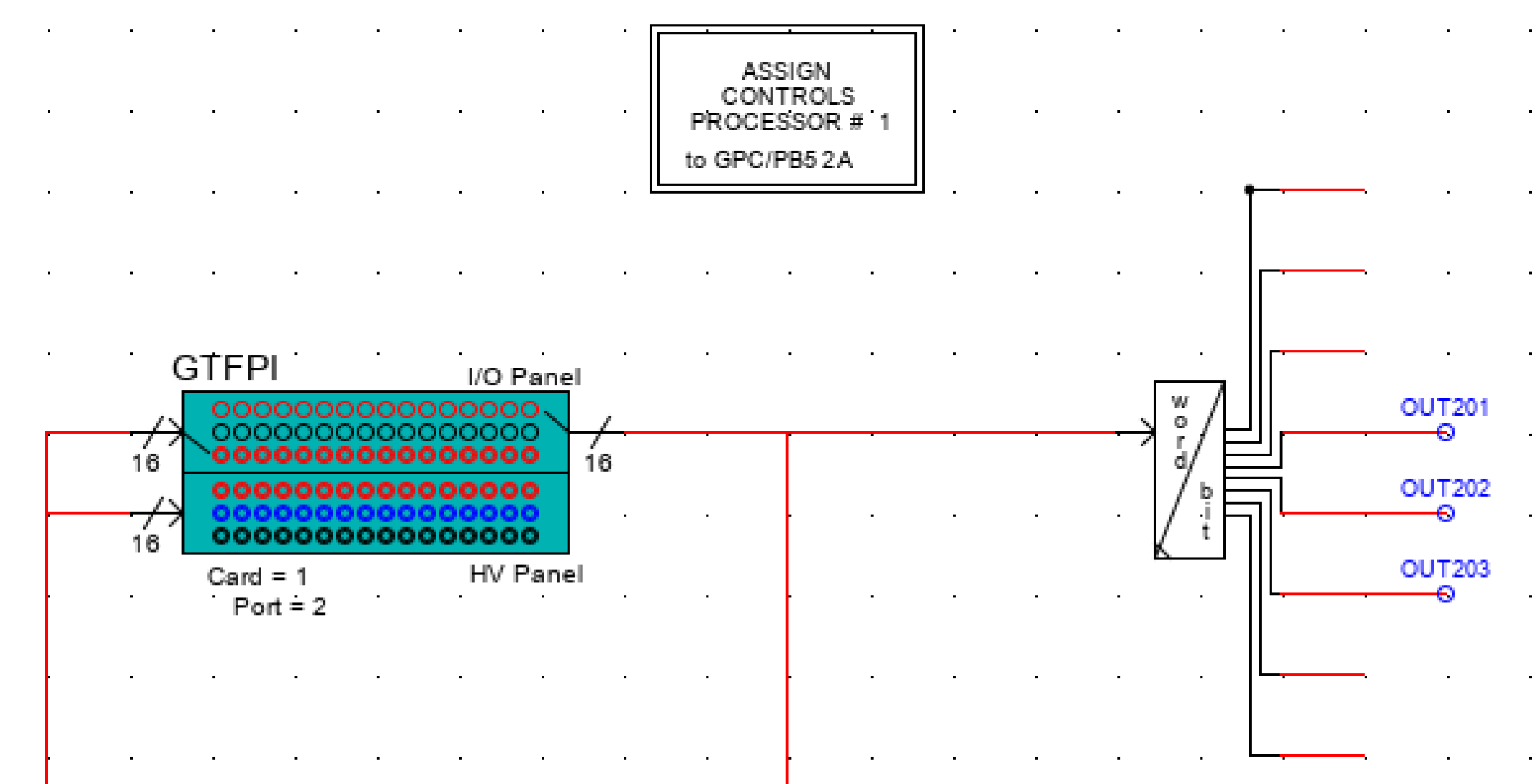
Runtime Simulation HMI

Future Work

- Develop a lab procedure for future power students to explore system modeling and inverter effects on power systems.



Photovoltaic Inverter Model



Output Signal From SEL-487B to RTDS

Special Thanks: Dr. Brian Johnson (Client/Advisor) • Dr. Feng Li (Lead Instructor) • Abdallah Smadi (Mentor) • Asad Mohammad (SEL) • Dr. Romulo Bainy (RTDS Expert) • Lukas Cevetello (SEL) • Amjad Al-Shakarji (SEL)